Good Morning

Thank You

- For inviting me to talk with you today
- My pleasure to be here at the historic Alamo

Alamo Siege

February 23 – March 8, 1836

Agenda For Today

- Overview of gas plant accounting
- Auditing gas plant statements
  - How do you determine if you have been paid correctly by the gas plant

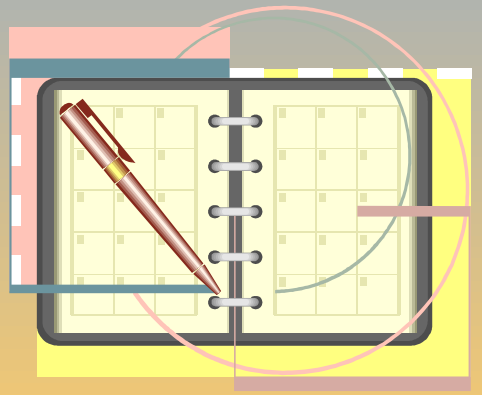
Gas Plant Accounting

Gas Plant Accounting

- Will look at gas plant accounting from the plant owner side
- How the plant owner allocates NGL and residue gas production to the gas producers
- How the plant owner reports earning for gas purchased or processed

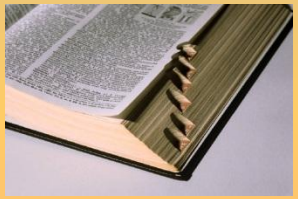
Gas Plant Accounting Outline

- Definitions
- How gas is processed
- Why gas is process
- Type Contracts
- Simple processing example



Terms Relative to Natural Gas

- Natural Gas – main component is methane (CH_4)
  - Home uses
    - Heating
    - Cooking
    - Water heating
  - Industrial uses
    - Generate electricity
    - Industrial fuel
- Measurement of Natural Gas
  - Volumes
    - Mcf – Thousand cubic feet
    - Mmcf – Million cubic feet
  - Energy content
    - Btu – British thermal units
    - Mmbtu – Million British thermal units



British Thermal Unit

- Amount of heat or energy needed to raise the temperature of one pound of water one degree Fahrenheit at sea level

- Approximately the heat generated by burning one wooded match 

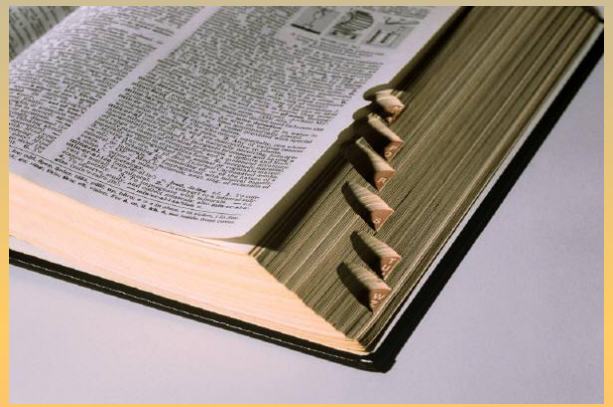
- The amount of energy needed to lift a one pound weight 778 feet 

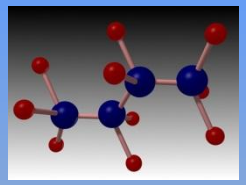
Terms Relative to Natural Gas

- Wet Gas – contains natural gas liquids (NGLs)
- Dry Gas – contains essentially no NGLs
- Sour Gas – contains CO_2 and/or H_2S
- Sweet Gas – no CO_2 or H_2S

Terms Most Commonly Associated With Gas Plants

- Natural Gas Liquids
- Natural Gas Liquid Products
- Plant Shrinkage
- Residue Gas
- GPM





Natural Gas Liquids

- Hydrocarbons that are a vapor under normal temperature and pressure
- Are recovered by processing a wet gas stream at a gas processing plant
- Accounted for in gallons
- May be shipped as a liquid by truck, rail or pipeline

Natural Gas Liquids

NGL Product		Primary Uses
Ethane	C_2H_6	Petrochemical Feedstock
Propane	C_3H_8	Rural home heating, carburation, crop drying
Butanes	C_4H_{10}	Blend into winter grade gasoline
Pentanes +	C_5H_{12}	Bend into gasoline

Plant Shrinkage

- Shrinkage in plant inlet gas volume caused by the extraction of NGLs

- Plant Volume Reduction (PVR)
  - Plant shrinkage measured in Mcf that occurs due to the removal of NGLs

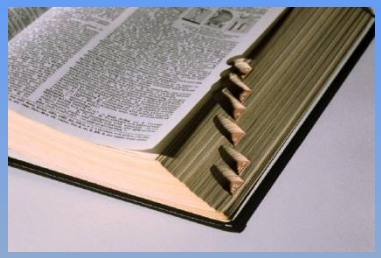
- Plant Thermal Reduction (PTR)
  - Plant shrinkage measured in Mmbtu's that occurs due to the removal of NGLs

Residue Gas

- Gas remaining after wet gas is treated to remove contaminants and NGLs

- Should meet pipeline gas specifications

GPM

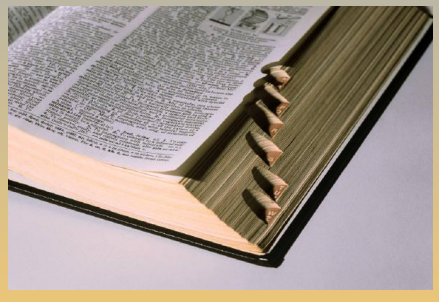


- GPM – gallons of NGLs per Mcf gas delivered

- Use to calculate theoretical volumes of NGL products

Terms Most Commonly Associated With Gas Plants

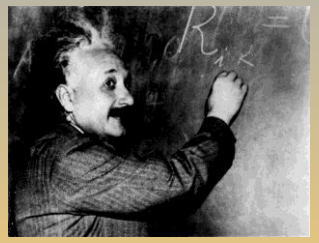
- Theoretical Gallons
- Plant Efficiency
- Raw Make Stream
- Fractionation
- Mol%



Theoretical Gallons

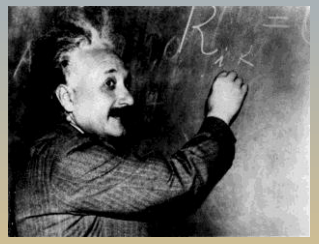
Gas Volume Delivered x GPM Content

- Delivered 10,000 Mcf of gas
- GPM content 1.25
- Theoretical gallons
  10,000 x 1.25 = 12,500 gallons



Theoretical Gallons

- Delivered 20,000 Mcf of gas
- GPM content 1.30



- Theoretical gallons 20,000 x 1.30
- Theoretical gallons = 26,000 gallon

Plant Efficiency

- The percent of NGLs contained in the plant inlet gas stream recovered through processing

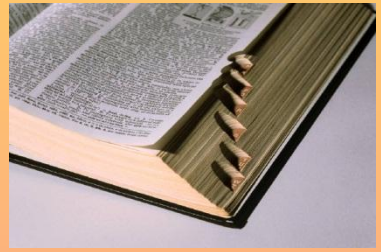
- Example: Inlet gas stream contains 40,000 gallons of NGLs

  Actual plant recovery 30,000 gallons

  Plant efficiency **75%** (30,000/40,000)

Additional Plant Definitions

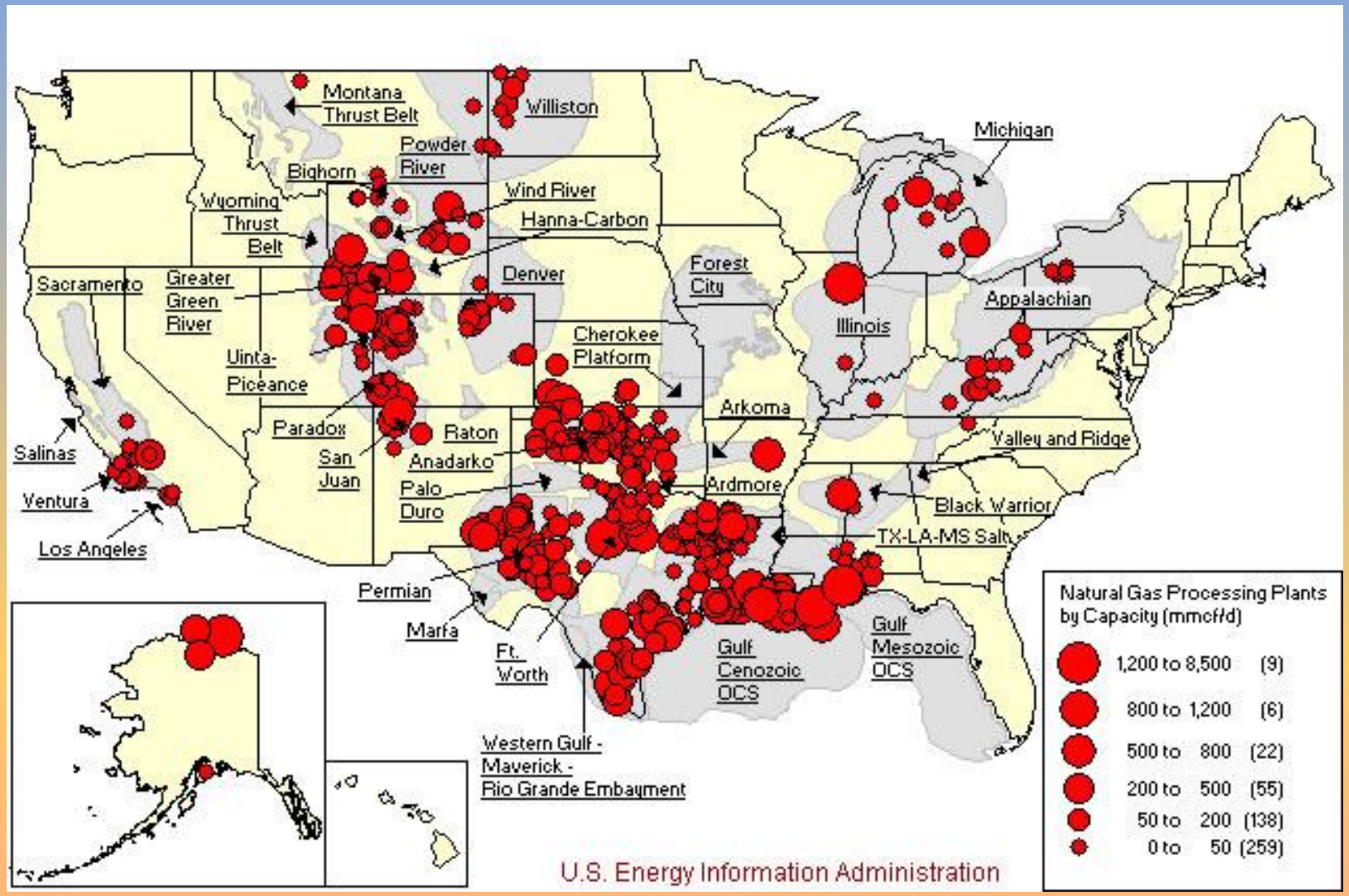
- Raw make stream – mixture of NGLs that are removed from the plant inlet gas stream
- Fractionation – the process of separating the raw make stream into separate NGL products



Classifications of Gas Plants

- By Design
  - Stationary
  - Skid-Mounted
- By Location
  - Central
  - Straddle
- By Extraction Process
  - Adsorption
  - Absorption
  - Chilled Oil
  - Refrigeration
  - Cryogenic
  - Turbine or Expander
  - Fractionation

Gas Plants in the United States



United States Plants

- Absorption (chilled oil) plants
  - Older plants
  - No market for ethane

- Cryogenic plants
  - Newer plants
  - Build to recover ethane

Plant Efficiencies

Product	Product Recovery				
	Absorption	Chilled Lean Oil	Refrigation	Cryogenic	Turbo Expander
Ethane	-	40%	-	70%	75% - 85%
Propane	50%	80%	-	95%	98%
Butanes	75%	85%	70%	98%	99%
Pentanes +	85% - 90%	95%	85%	99%	99%

Absorption Gas Plant







Scrubber

Amine Treater

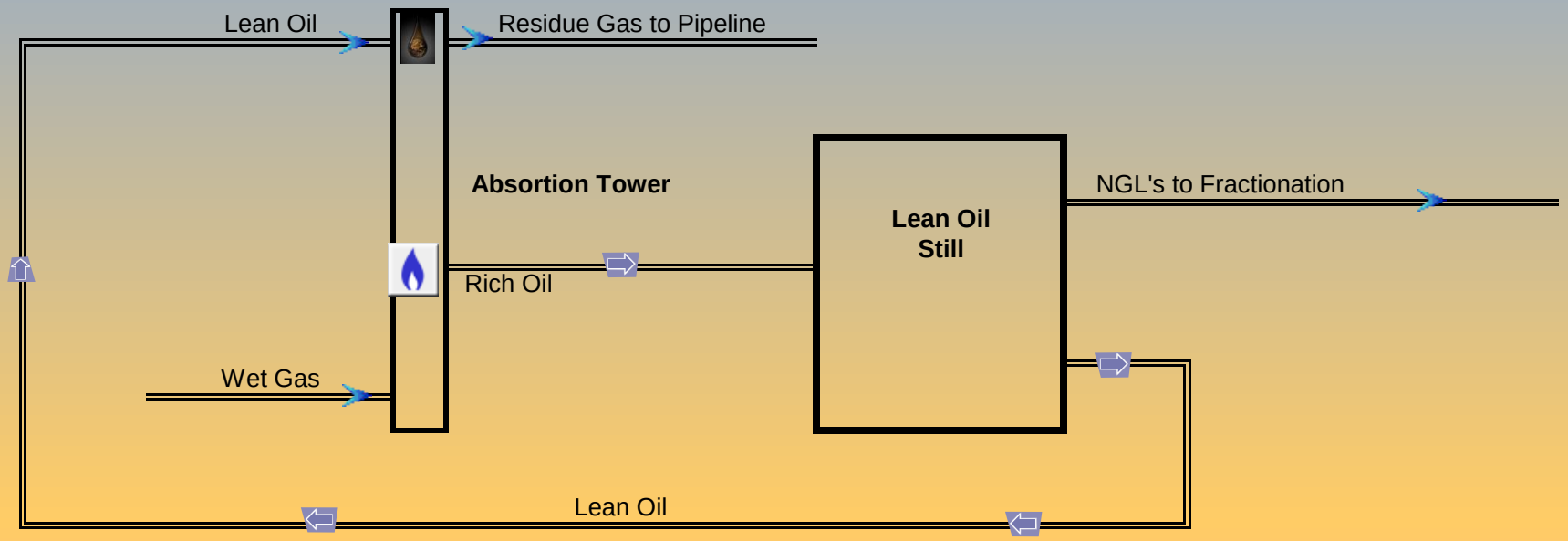
Dehydrator

Absorption Tower

Dehydrator

Compressor

Lean Oil Recovery



Cryogenic Process

- A rapid pressure drop lowers the temperature of the wet gas stream to (120^0) to (150^0) Fahrenheit
- A turbine expansion unit can lower the temperature even further to (180^0) Fahrenheit
- At these low temperature, essentially all ethane and heavier hydrocarbons liquefy

Cryogenic Gas Plant Gas Flow

Scrubber

Amine Treater

Dehydrator

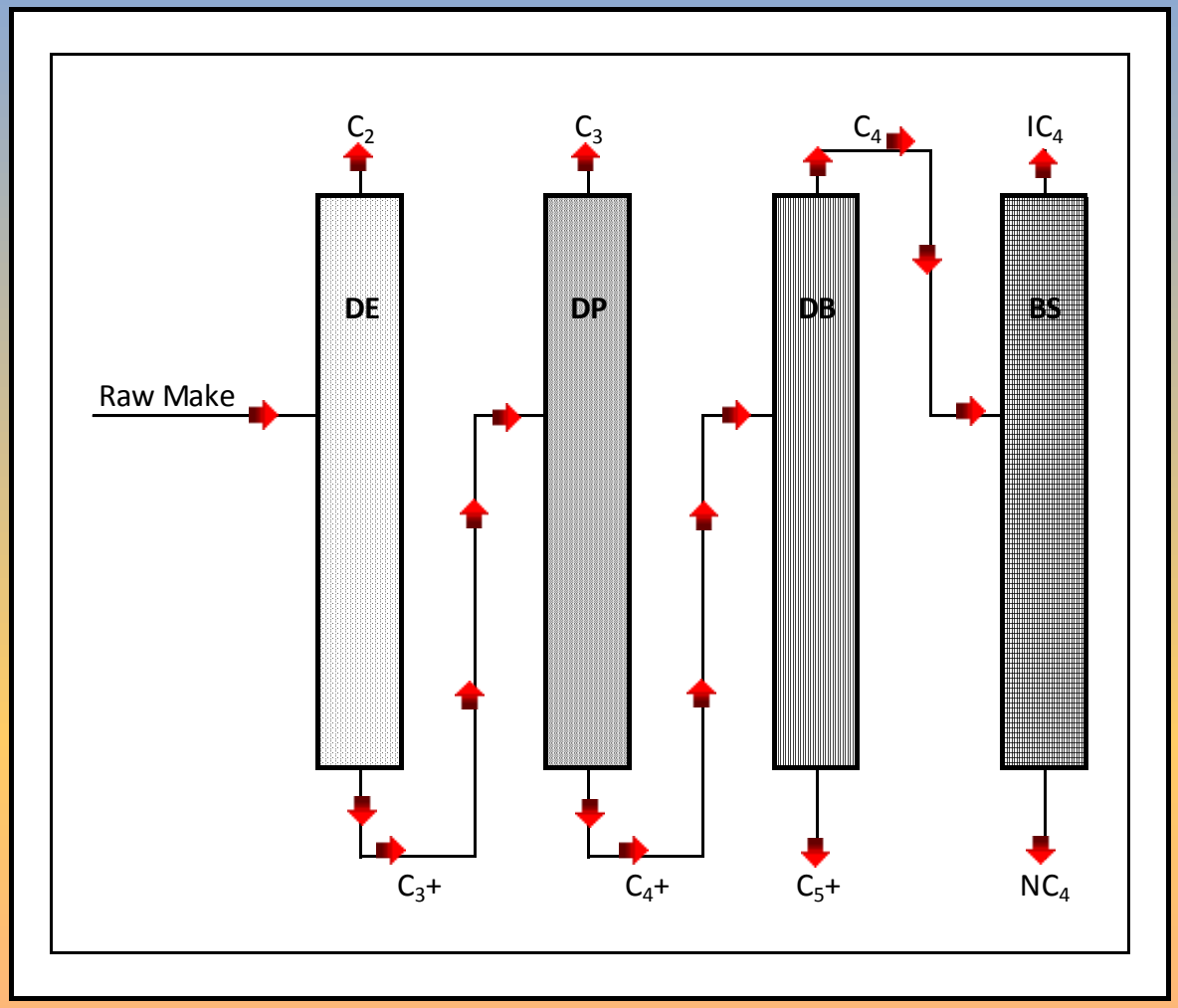
Cryogenic Unit

Compressor

Hydrocarbon Constants

Component	Formula	Relative Density Liquid	Relative Density Gas	Cf Gas Gal Liquid	Btu Gallon	Btu Cubic Foot	Boiling Point F
Methane	CH_4	-0.30000	0.5539	-	-	1,010.0	-258.73
Ethane	C_2H_6	0.35619	1.0382	37.476	65,869	1,769.6	-127.49
Propane	C_3H_8	0.50698	1.5226	36.375	90,830	2,516.1	-43.75
Iso-Butane	C_4H_{10}	0.56286	2.0068	30.639	98,917	3,251.9	10.78
N-Butane	C_4H_{10}	0.58401	2.0068	31.790	102,911	3,262.3	31.08
Iso-Pentane	C_5H_{12}	0.62470	2.4912	27.393	108,805	4,000.9	82.12
N-Pentane	C_5H_{12}	0.63111	2.4912	27.674	110,091	4,008.9	96.92
N-Hexane	C_6H_{14}	0.66382	2.9755	24.371	115,021	4,755.9	155.72

Fractionation



Fractionation

- May occur at the gas plant
- May occur at a central fractionation facility
  - Mt Belvieu, Texas
  - Conway, Kansas

Gas Processing

Wet Gas

NGLs

Residue Gas

Gas Plant Contracts

- Gas Purchase Agreement
  - Plant buys the gas at the measuring point
  - All products belong to the plant

- Gas Processing Agreement
  - Producer retains title to the gas
  - Producer pays the plant owner a processing fee

Purchase Agreement

- Plant may buy the gas at a fixed rate per Mcf delivered to the plant

- Plant may buy the gas based on a percent of the value of products allocated to the gas (POP agreement)

Processing Agreement Fees

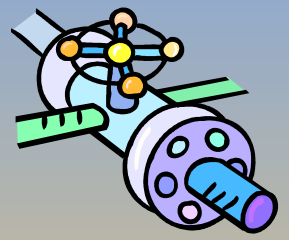
- Plant may charge a fixed rate per Mcf delivered to the plant
- Plant may charge a fixed rate per gallon of NGLs recovered from the gas
- Plant may keep a % of the NGLs recovered from the gas

Why Gas is Processed

- Cleanup – Remove impurities so that the residue gas meets pipeline specifications

- Economic – NGL products are worth more as individual products than if sold as natural gas

Pipeline Quality Gas



- Minimal CO_2 or H_2S

- Btu of the gas between 935 and 1035 Btu's per cubic foot

Cleanup Gas the Wet Gas

- Both CO_2 and H_2O must be removed from the wet gas delivered to a plant so that the plant residue gas meets pipeline specifications
- While there is a market for CO_2 and H_2S, the sale of these products is a byproduct for processing plants
- Basically a breakeven deal at best

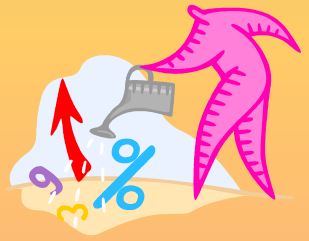
ONRR "Unbundling" Project

- ONRR has consistently held the position that costs incurred to make gas marketable are production costs and cannot be used to reduce royalty on federal leases

- Their current "unbundling" project is an attempt to quantify costs of services performed by gas plants that cleanup gas to make it marketable
  - Dehydration
  - Compression

Economics of NGL Recovery

Product	Btu Per Gallon	Minimum Product Price When Gas Price $ per Mmbtu					
		$2.00	$3.00	$4.00	$5.00	$6.00	$7.00
Ethane	66,473	$ 0.1329	$ 0.1994	$ 0.2659	$ 0.3324	$ 0.3988	$ 0.4653
Propane	91,735	0.1835	0.2752	0.3669	0.4587	0.5504	0.6421
Iso-Butane	99,860	0.1997	0.2996	0.3994	0.4993	0.5992	0.6990
N-Butane	103,952	0.2079	0.3119	0.4158	0.5198	0.6237	0.7277
Pentanes+	115,000	0.2300	0.3450	0.4600	0.5750	0.6900	0.8050



Breakeven Gas Price

Product	Btu Per Gallon	Current Price	Equilavent Gas Price $ / Mmbtu
Ethane	66,473	$0.225	$3.38
Propane	91,735	0.529	5.77
Iso-Butane	99,860	0.680	6.81
N-Butane	103,952	0.638	6.14
Pentanes+	115,000	1.180	10.26

Gas Processing Spread

- Based on a current gas spot price of $2.60 per Mmbtu @ Henry Hub
- Ethane price $0.225 per gallon @ Mt Belvieu
- Ethane a break even at best
- Margins on other NGL products okay 

Steps in Gas Plant Accounting

1. Calculate total plant production
2. Calculate theoretical volumes of NGLs and residue gas delivered through each measurement point
3. Allocate total plant production to each measurement point based on theoreticals
4. Determine the payment to each delivery point based on the gas purchase or processing agreement

Gas Plant Accounting

- All about allocations

- All allocations are wrong
- Goals of allocations
  - Reasonable
  - Fair
  - Consistent

Plant Production

- Total of all sales and deliveries
- Plus Ending Inventory
- Less Beginning Inventory

Plant Production Propane
(Gallons)

Truck Sales	100,000
Delivered to Pipelines	50,000
Loaded on Rail Cars	20,000
Total Sales	170,000
Ending Inventory	30,000
Beginning Inventory	(25,000)
Propane Production	175,000

Calculating Theoretical Gallons

- An orifice meter measures the Mcf gas delivered through each measurement point each month

- A sample of the gas is taken at each measurement point and the GPM content is determined

Calculating Theoretical Gallons

	Mcf	
Gas Volume	35,000	
Product	GPM	Theoretical Gallons
Propane	1.350	47,250
Iso-Butane	0.674	23,590
N-Butane	0.982	34,370
Pentanes +	1.346	47,110
Totals	4.352	152,320

Assume Plant Production and Total Theoreticals as Follows

Product	Total Gallons	
	Production	Theoretical
Propane	500,000	600,000
Iso-Butane	250,000	280,000
N-Butane	350,000	340,000
Pentanes +	550,000	560,000
Totals	1,650,000	1,780,000

Allocation of Plant Production

Product	Theoretical Gallons	Total Theoretical Gallons	Percent Theoretical
Propane	47,250	600,000	7.87500%
Iso-Butane	23,590	280,000	8.42500%
N-Butane	34,370	340,000	10.10882%
Pentanes +	47,110	560,000	8.41250%
Totals	152,320	1,780,000	

Product	Plant Production Gallons	Percent Theoretical	Allocated Production Gallons
Propane	500,000	7.87500%	39,375
Iso-Butane	250,000	8.42500%	21,063
N-Butane	350,000	10.10882%	35,381
Pentanes +	550,000	8.41250%	46,269
Totals	1,650,000		142,087

Residue Gas

Amount of residue gas determined by measurement:

- Residue gas delivered to pipeline for sale
- All measured and estimated fuel volumes
- Measured volume of gas delivered back to the producers for lease use

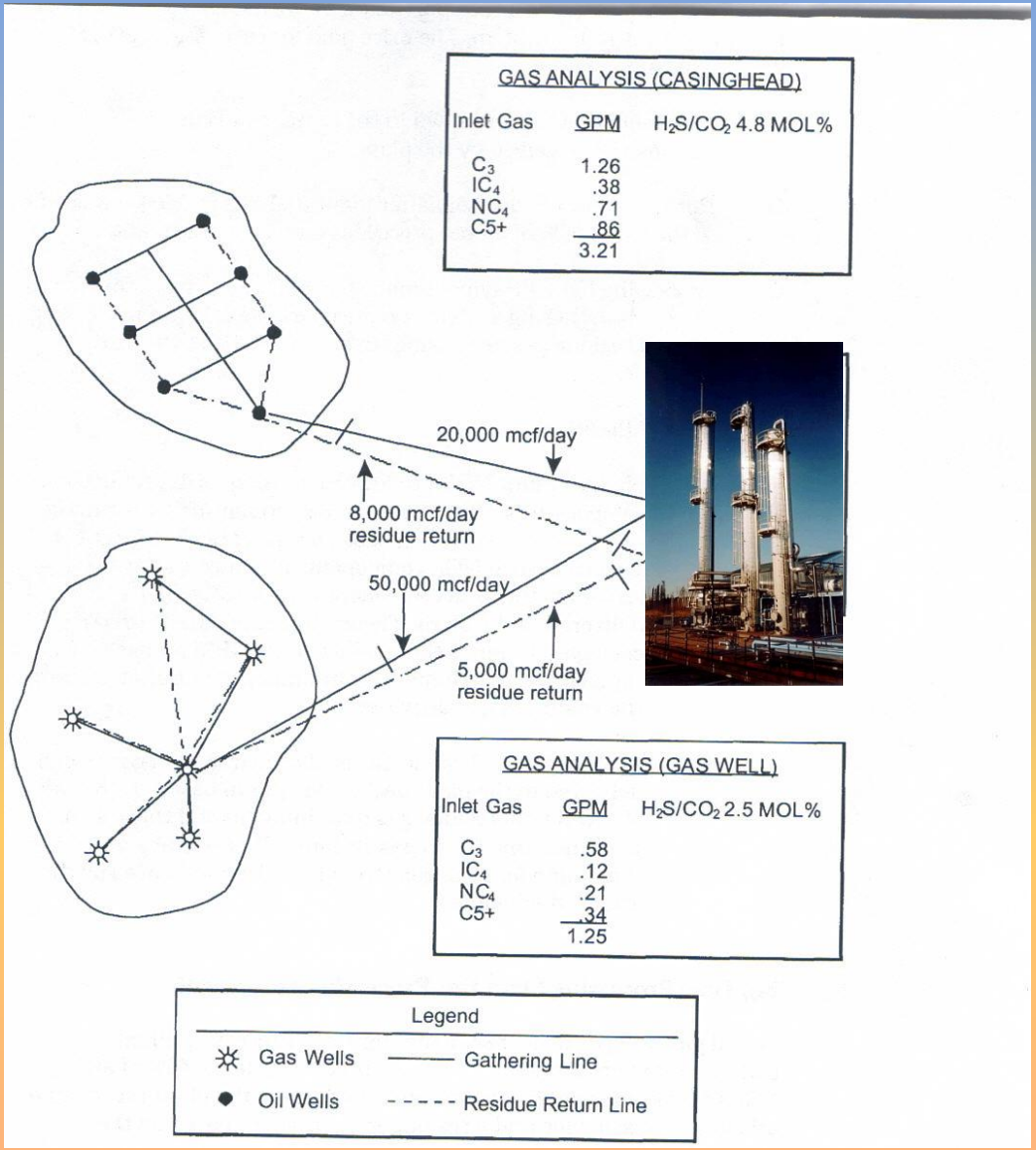
Allocation of Residue Gas

- Nothing adds up
- Plant inlet volume different that the sum of the field meters plus field compression fuel
- Plant inlet volume different that the sum of residue gas , plant fuel and product shrinkage
- Must make some allowance for gas measurement error

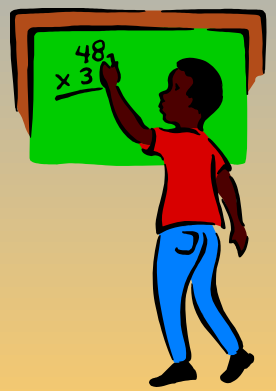
Allocation of Residue Gas

- Allocation to each measurement point based on theoretical residue gas remaining
- There are multiple ways to calculate theoretical residue gas remaining
- Hardest part of gas plant allocations

Big Time Schematic



Big Time
Theoretical Residue Gas



1.000000000000000

Less: acid gas mol %

Less: product shrinkage factor

Residue gas factor

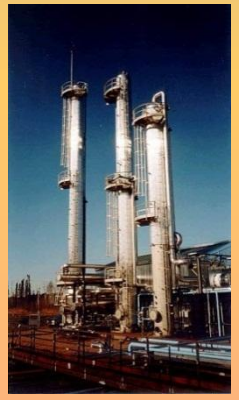
Theoretical Residue = Inlet Gas Volume x Residue Gas Factor

Big Time Processing Plant Product Shrinkage Factors

C3+ GPM	Product Shrinkage Factor
0 - .5	0.01125
.5 1.0	0.03375
1.0 -1.5	**0.05625**
1.5 - 2.0	0.07875
2.0 - 2.5	0.10125
2.5 - 3.0	0.12375
3.0 - 3.5	**0.14625**
3.5 - 4.0	0.16875
4.0 - 4.5	0.19125
4.5 - 5.0	0.21375

Big Time Processing Plant Residue Gas Factors

Producer		Acid Gas	Shrinkage Factor	Residue Factor
Casinghead Gas	1.00000	0.04800	0.14625	0.80575
Gas Well Gas	1.00000	0.02500	0.05625	0.91875



Big Time Processing Plant
Schedule of Processing Fees

Mol % H2S + CO2	Processing Fee $0.00 / Mcf
0% - 1%	$0.02
1% - 2%	0.04
2% - 3%	**0.06**
3% - 4%	0.08
4% - 5%	**0.10**
5% - 6%	0.12
6% - 7%	0.14
7% - 8%	0.16
8% - 9%	0.18
9% - 10%	0.20
Over 10%	0.25

Residue Returned to Lease
$0.05 per Mcf returned

Big Time Plant Contracts

Casinghead gas purchase contract

Price paid for the gas:

- 75% of the value of NGL's
- 90% of the value of residue gas
- Less processing fees
  - Acid gas removal
  - Residue gas returned

Big Time Contracts

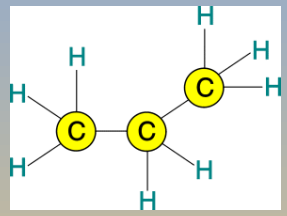
Gas well gas processing agreement

Processing fees

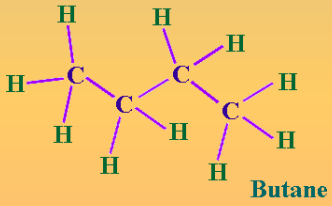
- 40% of the NGL's
- Processing fees
  - Acid gas removal
  - Residue gas returned

Big Time Processing Plant
NGL Allocation
April 2014

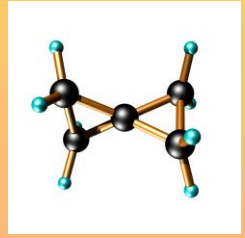
Casinghead Gas					
Volume Delivered Mcf	Product	GPM	Theoretical Gallons	% of Theoretical	Allocated Production
600,000	Propane	1.26	756,000	0.464944649	557,934
	Iso-Butane	0.38	228,000	0.558823529	209,559
	N-butane	0.71	426,000	0.574898785	405,304
	Pentanes+	0.86	516,000	0.502923977	505,439
	Totals	3.21	1,926,000		1,678,235



Gas Well Gas					
Volume Delivered Mcf	Product	GPM	Theoretical Gallons	% of Theoretical	Allocated Production
1,500,000	Propane	0.58	870,000	0.535055351	642,066
	Iso-Butane	0.12	180,000	0.441176471	165,441
	N-butane	0.21	315,000	0.425101215	299,696
	Pentanes+	0.34	510,000	0.497076023	499,561
	Totals	1.25	1,875,000		1,606,765



Total Plant					
	Product		Total Theoretical Production		Total Plant Production
	Propane		1,626,000		1,200,000
	Iso-Butane		408,000		375,000
	N-butane		741,000		705,000
	Pentanes+		1,026,000		1,005,000
	Totals		3,801,000		3,285,000



Big Time Processing Plant
Residue Gas Allocation
April 2014

System	Mcf Delivered	Residue Factor	Mcf Theoretical Residue	% of Theoretical	Mcf Allocated Residue
Casinghead Gas	600,000	0.80575	483,450	0.259699448	467,459
Gas Well Gas	1,500,000	0.91875	1,378,125	0.740300552	1,332,541
Totals	2,100,000		1,861,575	1.000000000	1,800,000

Plant Residue 1,800,000

Big Time Processing Plant
Casinghead Gas Purchased
April 2014

NGLs

Product	Allocated Gallons	$ per Gallon	Value	Lease Share	Lease Value
Propane	557,934	$ 0.50	$ 278,966.79		
Iso-Butane	209,559	0.55	115,257.35		
N-butane	405,304	0.55	222,917.00		
Pentanes+	505,439	0.95	480,166.67		
Totals	1,678,235		$ 1,097,307.81	75.00%	$ 822,980.86

Residue Gas

Mcf			Residue Price	Residue	Lease
Allocated Residue	Residue Returned	Residue Sales	$ per Mcf	Value	Value
467,459	240,000	227,459	$3.92298	$ 892,316.59	
			Lease Share	90.00%	$ 803,084.93

Processing Fees

Fee	Mcf Volume	Fee $ per Mcf	Processing Fee	Total Fee Deductions
Acid Gas	600,000	$0.10	$ 60,000.00	
Residue Returned	240,000	$0.05	12,000.00	$ 72,000.00

Net Due Producer $ 1,554,065.79

Big Time Processing Plant
Gas Well Gas Processed
April 2014

NGLs

Product	Allocated Gallons	$ per Gallon	Value	Lease Share	Lease Value
Propane	642,066	$ 0.50	$ 321,033.21		
Iso-Butane	165,441	0.55	90,992.65		
N-butane	299,696	0.55	164,833.00		
Pentanes+	499,561	0.95	474,583.33		
Totals	1,606,765		$ 1,051,442.19	60.00%	$ 630,865.31

Residue Gas

Mcf			Residue Price $ per Mcf	Residue Value	Lease Value
Allocated Residue	Residue Returned	Residue Sales			
1,332,541	150,000	1,182,541	$3.92298	$ 4,639,081.82	
			Lease Share	100.00%	$ 4,639,081.82

Processing Fees

Fee	Mcf Volume	Fee $ per Mcf	Processing Fee	Total Fee Deductions
Acid Gas	1,500,000	$0.06	$ 90,000.00	
Residue Returned	150,000	$0.05	7,500.00	$ 97,500.00

Net Due Producer $ 5,172,447.14

Big Time Processing Plant
Gross Margin
April 2014

Sales		
NGLs	$ 1,517,884.69	
Residue Gas	892,316.59	
Processing Fees	97,500.00	
Total Revenue		$ 2,507,701.27
Casinghead Gas Purchased		1,554,065.79
Gross Margin		$ 953,635.49

April NGL Sales

How in the world did you calculate NGL sales?

April NGL Sales

100% of NGLs from casinghead gas	$1,097,307.81
40% processing fee on gas well gas	420,576.88
Total NGL sales	$1,517,884.69

Other Plant Sales

- Residue gas (all from casinghead gas)
- Processing fees (all from gas well gas)

Big Time Processing Plant
Proof on Income Allocation
April 2014

100% Sales	Casinghead Gas	Gas Well Gas	Total
Natural Gas Liquids	$ 1,097,307.81	$ 1,051,442.19	$ 2,148,750.00
Residue Gas	892,316.59	4,639,081.82	5,531,398.41
Totals	$ 1,989,624.40	$ 5,690,524.01	$ 7,680,148.41

Payments	
Casinghead Gas Producers	$ 1,554,065.79
Gas Well Gas Producers	5,172,447.14
Plant Gross Margin	953,635.49
Total Revenue	$ 7,680,148.41

Alamo Casualties

- Texans – Between 182 and 257
- Mexicans – 600 killed or wounded

Noted Americans Fighting for Texas

- Micajah Autry
- James Bonham
- James Bowie
- William Travis
- Davy Crockett

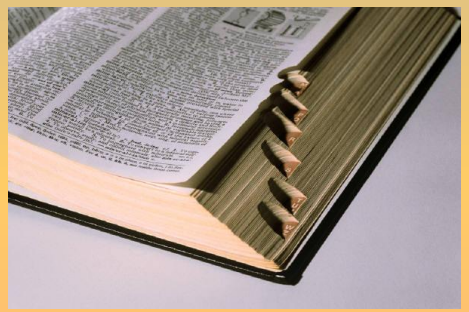
Audit

A review to determine the accuracy and validity of records and reports or the conformity of procedures with established policy …

Dictionary of Accounting

Second Edition

by Ralph Estes



Auditing

- Tried auditing twice
  - 1972 – Internal auditing for Cities Service
  - 1998 – Did several revenue audits
- Decided auditing not my thing
  - Not tough enough to be an auditor
  - Is anyone ever glad to see you?
- Here I am talking to you about auditing

Auditing Plant Payments

- Were leases that delivered gas to a processing plant paid correctly for all NGLs and residue gas?

- Underpayment to leases delivering gas to a plant could be due to:
  - Valuation of plant production and sales
  - Allocations of plant production and sales to measurement points

State & Federal Leases

- Fees to clean up gas delivered to a plant for processing may not be deductible:
  - Acid gas removal
  - Residue returned
- Other nondeductible fees
  - Gas compression
  - Gas dehydration

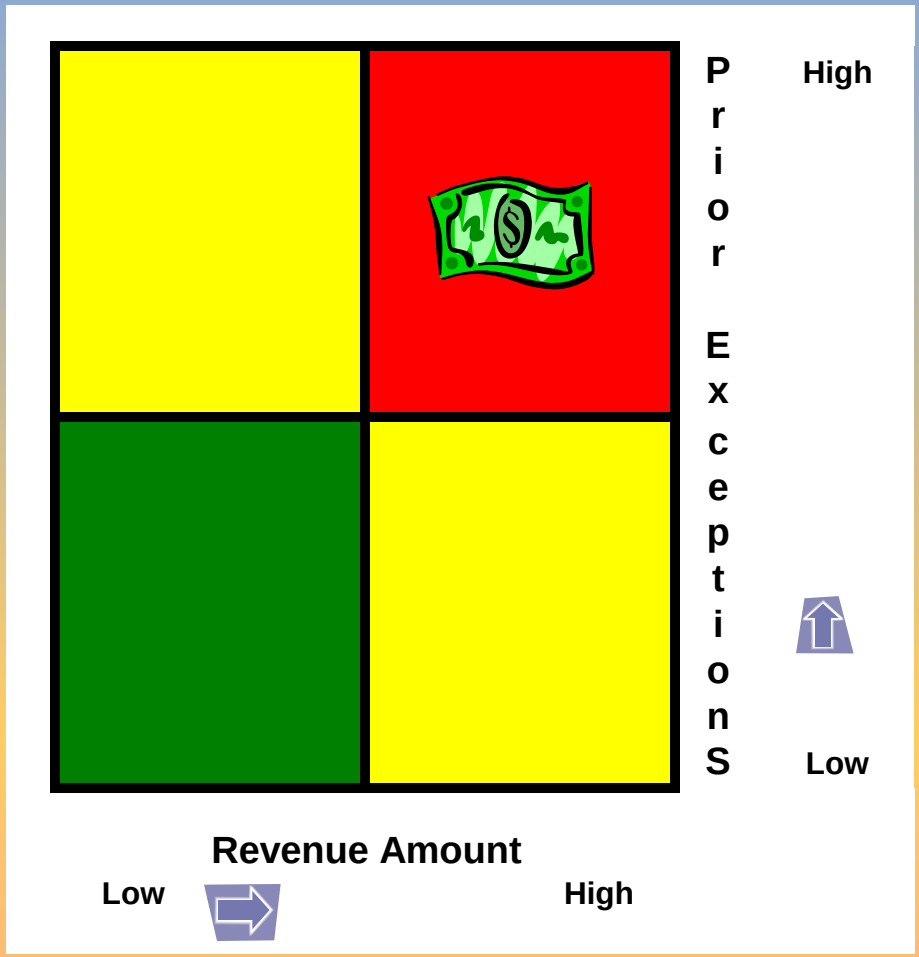
Staffing

- Does your department have the staff to audit all leases every year
- Probably not
- Must audit properties that have the highest potential for additional revenue

Which Properties to Audit

- Revenue generated
- Prior fluctuations and audit exceptions
- New properties

Which Properties to Audit



New Properties

- Especially properties with large production and sales volumes
- Warrant a detailed review
- Initial set-up problems tend to persist until uncovered and corrected

New Properties

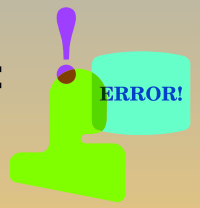
- Review of first plant statements is especially important for gas sold or processed at gas plants
- Plants statements should be compared with the sales or processing agreement.
- Plant may have set up the new property incorrectly

First Statement Received

Payment For Natural Gas Liquids										
Mcf	Product	Gpm	Theoretical Gallons	Total Theoretical Gallons	Percent Theoretical	Plant Production	Allocated NGLs	Product Prices	NGL Sales	NGL Value
500,000	Propane	1.263	631,500	7,279,400	8.6751655%	5,000,000	433,758.28	$ 0.80	$ 347,006.62	
	Butanes	0.865	432,500	5,522,410	7.8317256%	4,000,000	313,269.03	0.90	281,942.12	
	Pentanes +	0.562	281,000	3,348,740	8.3912158%	2,800,000	234,954.04	1.00	234,954.04	
	Totals	2.690	1,345,000	16,150,550		11,800,000	981,981.34		$ 863,902.79	
								Lease Percent	70.00%	$ 604,731.95
Payment For Residue Gas										
Mcf	Product Shrinkage	Theoretical Remaining	Total Theoretical Remaining	Percent Theoretical	Actual Residue	Allocated Residue	Allocated Fuel	Residue Returned	Residue Sold	Residue Value
500,000	31,362	468,638	5,638,368	8.3115916%	4,800,000	398,956	9,820	120,000	269,136	
							$Mcf	$2.60	$699,754.63	
								Lease Percent	75.00%	524,815.97
							Total Payment			$ 1,129,547.92

First Statement Received

- Good looking statement
- Only problem, the lease percentages are wrong
- Plant paid 70% of liquids and 75% of residue gas



- Should have paid 75% of liquids and 80% of residue gas


HUMAN ERROR .. YET AGAIN
E. Smith

First Statement Received

Payment For Natural Gas Liquids

Mcf	Product	Gpm	Theoretical Gallons	Total Theoretical Gallons	Percent Theoretical	Plant Production	Allocated NGLs	Product Prices	NGL Sales	NGL Value
500,000	Propane	1.263	631,500	7,279,400	8.6751655%	5,000,000	433,758.28	$ 0.80	$347,006.62	
	Butanes	0.865	432,500	5,522,410	7.8317256%	4,000,000	313,269.03	0.90	281,942.12	
	Pentanes +	0.562	281,000	3,348,740	8.3912158%	2,800,000	234,954.04	1.00	234,954.04	
	Totals	2.690	1,345,000	16,150,550		11,800,000	981,981.34		$863,902.79	
								Lease Percent	75.00%	$ 647,927.09

Payment For Residue Gas

Mcf	Product Shrinkage	Theoretical Remaining	Total Theoretical Remaining	Percent Theoretical	Actual Residue	Allocated Residue	Allocated Fuel	Residue Returned	Residue Sold	Residue Value
500,000	31,362	468,638	5,638,368	8.3115916%	4,800,000	398,956	9,820	120,000	269,136	
							$Mcf	$2.60	$699,754.63	
								Lease Percent	80.00%	559,803.70
							Total Payment			$ 1,207,730.79

New Properties

Correct Payment	$ 1,207,730.79
Payment Received	1,129,547.92
Difference	$ 78,182.87
State Royalty	$ 9,772.86
Working interest owners	$ 68,410.01

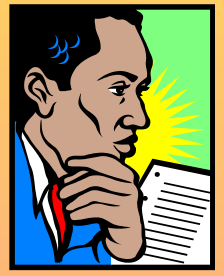
Valuing Plant Production & Sales

- Gallons of plant production reported in the plant allocation statements
- Prices of NGL sales

Underreporting Plant Production How to Check

- Plant production volumes are reported to government agencies
  - Texas Railroad Commission report R-3

- Volumes reported to these agencies should be the same volumes entered into the plant allocation system



Underreporting Plant Production

- Fairly rare, to easy to catch 
- If the plant operator wants to cheat the gas producers, there are more smarter ways to do it 

Undervaluing NGL Sales

- Sell products to subsidiary companies at below market value
- Undervalue products that were part of an exchange agreement
- Undervalue products that were part of a purchase and resale arrangement

Selling Products to a Subsidiary Company

- The gas plant sells all plant products to a subsidiary marketing company

- The marketing company sell the products to third party companies at higher prices

Selling Products to a Subsidiary Company

- Sales to subsidiary marketing company
- ONRR regulations provide that plant products should be valued at prices received by the marketing company
- This would be a good rule for you to follow

Selling Products to a Subsidiary Company

Product	Gallons Sold	Sales Price	Market Price
Propane	500,000	$0.70	$ 0.80
Butanes	300,000	0.80	0.90
Pentanes +	240,000	1.00	1.10

Selling Products to a Subsidiary Company

Product	Sales		
	Reported	Actual	Difference
Propane	$350,000	$400,000	$ 50,000
Butanes	240,000	270,000	30,000
Pentanes +	240,000	264,000	24,000
Totals	$830,000	$934,000	$ 104,000
	Lease Share	75.00%	$ 78,000

Lease Owners

Owner	Revenue Interest	Additional Sales
State Royalty	12.50%	$ 9,750
Working Interest	87.50%	68,250
Totals	100.00%	$ 78,000

Exchanging NGL Products

- Company A delivers NGL products to Company B at one location
- Company B delivers NGL products to Company A at another location
- Since the products were not sold, how should they be valued?

Exchange Agreements

Texas Plant

Kansas Plant

Exchanging NGL Products

- Each company should value the products based on spot prices for NGLs (Mont Belvieu, Texas or Conway, Kansas)
- Adjustments for transportation and fractionation

Purchase and Resale Agreements

- Company A sells NGL products to Company B at one location
- Company B sells identical NGL products to Company A at another location
- Each sale appears to be an independent sale to an unrelated third party

Purchase and Resale Agreements

- Extremely hard to spot
- Each sale is to a third party

- Would need to know of both transactions to put the two sales together

One Project I Worked On

- Group of lawyers suing a gas plant in Florida
- “I know they are cheating us”
- “You find out how”

Partners Taking Products in Kind

- All partners were taking the pentanes+ in kind
- There was a $5.00 per barrel or $0.119 per gallon difference between the high and low valuation
- Something is not right

Misallocation of Plant Production

- Understating volumes delivered from your lease
  - Metered gas volumes
  - NGL content
- Overstating volumes delivered from other leases
  - Metered gas volumes
  - NGL content
- Phantom leases

Misallocation of Plant Production Example

- State has 12.5% royalty interest in Lease B
- Lease B is credited with 75% of the value of all liquids attributable to the lease

Understate Volumes Lease B

- Report too low Mcf volume delivered to the plant, or
- Report too low GPM content on gas delivered
- Both errors result in lower allocations of plant NGL volumes

Misallocation of Plant Production

Actual Gas Volumes and Content

Lease A	Mcf Delivered	Product	Gpm	Theoretical Gallons	Percent Theoretical	Allocated Production
	500,000	Propane	1.237	618,500	0.54792700	487,655
		Butanes	0.982	491,000	0.53300043	466,375
		Pentanes +	1.034	517,000	0.53789731	476,039
		Totals	3.253	1,626,500		1,430,070
Lease B	Mcf Delivered	Product		Theoretical Gallons	Percent Theoretical	Allocated Production
	450,000	Propane	1.134	510,300	0.45207300	402,345
		Butanes	0.956	430,200	0.46699957	408,625
		Pentanes +	0.987	444,150	0.46210269	408,961
		Totals	3.077	1,384,650		1,219,930
Totals	Mcf Delivered	Product		Total Theoretical		Plant Production
	950,000	Propane		1,128,800		890,000
		Butanes		921,200		875,000
		Pentanes +		961,150		885,000
		Totals		3,011,150		2,650,000

Misallocation of Plant Production

Under Reported Volumes Lease B

Lease A	Mcf Delivered	Product	Gpm	Theoretical Gallons	Percent Theoretical	Allocated Production
	500,000	Propane	1.237	618,500	0.55348737	492,604
		Butanes	0.982	491,000	0.53858979	471,266
		Pentanes +	1.034	517,000	0.54347826	480,978
		Totals	3.253	1,626,500		1,444,848
Lease B	Mcf Delivered	Product		Theoretical Gallons	Percent Theoretical	Allocated Production
	440,000	Propane	1.134	498,960	0.44651263	397,396
		Butanes	0.956	420,640	0.46141021	403,734
		Pentanes +	0.987	434,280	0.45652174	404,022
		Totals	3.077	1,353,880		1,205,152
Totals	Mcf Delivered	Product		Total Theoretical		Plant Production
	940,000	Propane		1,117,460		890,000
		Butanes		911,640		875,000
		Pentanes +		951,280		885,000
		Totals		2,980,380		2,650,000

Misallocation of Plant Production

Under Reported Volumes Lease B

Lease A	Product	Allocated Production	Value	Revenue	Lease 75.00%
	Propane	4,949	$0.80	$ 3,958.98	$ 2,969.24
	Butanes	4,891	0.85	4,157.09	3,117.81
	Pentanes +	4,939	1.20	5,926.97	4,445.23
	Totals	14,779		$ 14,043.04	$ 10,532.28
Lease B	Product	Allocated Production	Value	Revenue	Lease 75.00%
	Propane	(4,949)	$0.80	$ (3,958.98)	$ (2,969.24)
	Butanes	(4,891)	0.85	(4,157.09)	(3,117.81)
	Pentanes +	(4,939)	1.20	(5,926.97)	(4,445.23)
	Totals	(14,779)		$(14,043.04)	$(10,532.28)

Understate Volumes From Lease B Owners Lease B

- State Royalty $ 1,316.54
- Working Interest 9,215.74
- Total Lease $10,532.28

Misallocation of Plant Production

Under Reported GPM Content Lease B

Lease A	Mcf Delivered	Product	Gpm	Theoretical Gallons	Percent Theoretical	Allocated Production
	500,000	Propane	1.237	618,500	0.55344280	492,564
		Butanes	0.982	491,000	0.53852481	471,209
		Pentanes +	1.034	517,000	0.54349540	480,993
		Totals	3.253	1,626,500		1,444,767
Lease B	Mcf Delivered	Product		Theoretical Gallons	Percent Theoretical	Allocated Production
	450,000	Propane	1.109	499,050	0.44655720	397,436
		Butanes	0.935	420,750	0.46147519	403,791
		Pentanes +	0.965	434,250	0.45650460	404,007
		Totals	3.009	1,354,050		1,205,233
Totals	Mcf Delivered	Product		Total Theoretical		Plant Production
	950,000	Propane		1,117,550		890,000
		Butanes		911,750		875,000
		Pentanes +		951,250		885,000
		Totals		2,980,550		2,650,000

Misallocation of Plant Production

Under Reported GPM Content Lease B

Lease A	Product	Allocated Production	Value	Revenue	Lease 75.00%
	Propane	4,909	$0.80	$ 3,927.25	$ 2,945.44
	Butanes	4,834	0.85	4,108.76	3,081.57
	Pentanes +	4,954	1.20	5,945.17	4,458.88
	Totals	14,697		$ 13,981.18	$ 10,485.88
Lease B	Product	Allocated Production	Value	Revenue	Lease 75.00%
	Propane	(4,909)	$0.80	$ (3,927.25)	$ (2,945.44)
	Butanes	(4,834)	0.85	$ (4,108.76)	(3,081.57)
	Pentanes +	(4,954)	1.20	$ (5,945.17)	(4,458.88)
	Totals	(14,697)		$(13,981.18)	$(10,485.88)

Understate GPM Lease B
Owners Lease B

- State Royalty $ 1,310.74
- Working Interest 9,175.14
- Total Lease $10,485.88

Misallocation of Plant Production Double Whammy

Double Whammy Lease B

Lease A	Mcf Delivered	Product	Gpm	Theoretical Gallons	Percent Theoretical	Allocated Production
	500,000	Propane	1.237	618,500	0.55898993	497,501
		Butanes	0.982	491,000	0.54410461	476,092
		Pentanes +	1.034	517,000	0.54906542	485,923
		Totals	3.253	1,626,500		1,459,515
Lease B	Mcf Delivered	Product		Theoretical Gallons	Percent Theoretical	Allocated Production
	440,000	Propane	1.109	487,960	0.44101007	392,499
		Butanes	0.935	411,400	0.45589539	398,908
		Pentanes +	0.965	424,600	0.45093458	399,077
		Totals	3.009	1,323,960		1,190,485
Totals	Mcf Delivered	Product		Total Theoretical		Plant Production
	940,000	Propane		1,106,460		890,000
		Butanes		902,400		875,000
		Pentanes +		941,600		885,000
		Totals		2,950,460		2,650,000

Double Whammy

Double Whammy

Lease A	Product	Allocated Production	Value	Revenue	Lease 75.00%
	Propane	9,846	$0.80	$ 7,876.81	$ 5,907.60
	Butanes	9,716	0.85	8,258.73	6,194.05
	Pentanes +	9,884	1.20	11,860.53	8,895.40
	Totals	29,446		$ 27,996.07	$ 20,997.05
Lease B	Product	Allocated Production	Value	Revenue	Lease 75.00%
	Propane	(9,846)	$0.80	$ (7,876.81)	$ (5,907.60)
	Butanes	(9,716)	0.85	(8,258.73)	(6,194.05)
	Pentanes +	(9,884)	1.20	(11,860.53)	(8,895.40)
	Totals	(29,446)		$(27,996.07)	$(20,997.05)

Double Whammy Owners Lease B

- State Royalty $ 2,624.63
- Working Interest 18,372.42
- Total Lease $20,997.05

Under Reporting Gas Delivered to the Plant How to Check

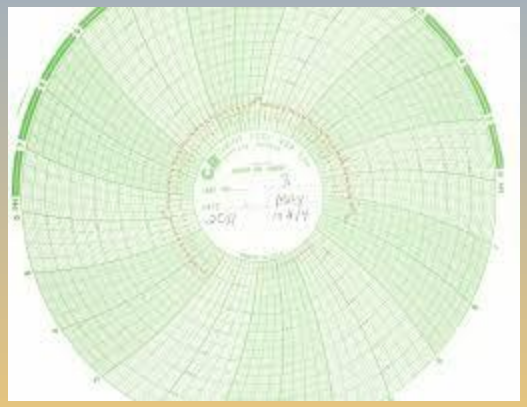
- Make sure the plant operator calibrates the gas meter at the time intervals specified in the contract

- Have an expert witness the meter calibration

- Install a check meter to verify the gas volume, if the gas volume delivered to the plant justifies the costs

Under Reporting Gas Delivered to the Plant How to Check

- Might consider getting the orifice charts from the plant operator



- Integrate the charts yourself
- Compare your calculated volumes with the volumes calculated by the plant operator

Gas Analysis
How to Check

- Take an independent gas sample and compare with the gas analysis used by the plant operator
- Witness the sampling of gas taken from your leases
- Beware of large changes when new gas samples are taken by the plant operator
- Beware if plant efficiencies are too high

Under Deliveries From Your Lease Increasing Plant Efficiency

Plant Efficiency

Actual	Total Plant Production / Total Theoretical	2,650,000 / 3,011,150	=	88.00624%
Reduced Volumes	Total Plant Production / Total Theoretical	2,650,000 / 2,980,380	=	88.91484%
Reduced Gpm	Total Plant Production / Total Theoretical	2,650,000 / 2,980,550	=	88.90976%
Double Whammy	Total Plant Production / Total Theoretical	2,650,000 / 2,950,460	=	89.81650%

Under Deliveries From Your Lease Increasing Plant Efficiency

- These changes in plant efficiency fairly small
- Would be very difficult to pick up based solely on changes in plant efficiency

Overstate Volumes From Other Leases

- Overstate Mcf volumes delivered to the plant from other leases
- Overstate Gpm content on other leases
- Both errors result in lower allocation of plant production to your lease

Misallocation of Plant Production

Over Reported Volumes Lease A

Lease A	Mcf Delivered	Product	Gpm	Theoretical Gallons	Percent Theoretical	Allocated Production
	510,000	Propane	1.237	630,870	0.55282736	492,016
		Butanes	0.982	500,820	0.53792615	470,685
		Pentanes +	1.034	527,340	0.54281567	480,392
		Totals	3.253	1,659,030		1,443,094
Lease B	Mcf Delivered	Product		Theoretical Gallons	Percent Theoretical	Allocated Production
	450,000	Propane	1.134	510,300	0.44717264	397,984
		Butanes	0.956	430,200	0.46207385	404,315
		Pentanes +	0.987	444,150	0.45718433	404,608
		Totals	3.077	1,384,650		1,206,906
Totals	Mcf Delivered	Product		Total Theoretical		Plant Production
	960,000	Propane		1,141,170		890,000
		Butanes		931,020		875,000
		Pentanes +		971,490		885,000
		Totals		3,043,680		2,650,000

Misallocation of Plant Production

Over Reported Volumes Lease A

Lease A	Product	Allocated Production	Value	Revenue	Lease 75.00%
	Propane	4,361	$0.80	$ 3,489.06	$ 2,616.79
	Butanes	4,310	0.85	3,663.50	2,747.62
	Pentanes +	4,353	1.20	5,223.30	3,917.48
	Totals	13,024		$ 12,375.86	$ 9,281.89
Lease B	Product	Allocated Production	Value	Revenue	Lease 75.00%
	Propane	(4,361)	$0.80	$ (3,489.06)	$ (2,616.79)
	Butanes	(4,310)	0.85	(3,663.50)	(2,747.62)
	Pentanes +	(4,353)	1.20	(5,223.30)	(3,917.48)
	Totals	(13,024)		$(12,375.86)	$ (9,281.89)

Overstate Gas Volumes Lease A Owners Lease B

- State Royalty $1,160.24
- Working Interest 8,121.65
- Total Lease $9,281.89

Misallocation of Plant Production

Over Reported GPM Lease A

Lease A	Mcf Delivered	Product	Gpm	Theoretical Gallons	Percent Theoretical	Allocated Production
	500,000	Propane	1.275	637,500	0.55541035	494,315
		Butanes	1.012	506,000	0.54048280	472,922
		Pentanes +	1.066	533,000	0.54546385	482,736
		Totals	3.353	1,676,500		1,449,973
Lease B	Mcf Delivered	Product		Theoretical Gallons	Percent Theoretical	Allocated Production
	450,000	Propane	1.134	510,300	0.44458965	395,685
		Butanes	0.956	430,200	0.45951720	402,078
		Pentanes +	0.987	444,150	0.45453615	402,264
		Totals	3.077	1,384,650		1,200,027
Totals	Mcf Delivered	Product		Total Theoretical		Plant Production
	950,000	Propane		1,147,800		890,000
		Butanes		936,200		875,000
		Pentanes +		977,150		885,000
		Totals		3,061,150		2,650,000

Misallocation of Plant Production

Over Reported GPM Lease A

Lease A	Product	Allocated Production	Value	Revenue	Interest 12.50%
	Propane	6,660	$0.80	$ 5,328.14	$ 3,996.11
	Butanes	6,547	0.85	5,565.01	4,173.76
	Pentanes +	6,696	1.20	8,035.66	6,026.75
	Totals	19,904		$ 18,928.82	$ 14,196.61
Lease B	Product	Allocated Production	Value	Revenue	Interest 12.50%
	Propane	(6,660)	$0.80	$ (5,328.14)	$ (3,996.11)
	Butanes	(6,547)	0.85	(5,565.01)	(4,173.76)
	Pentanes +	(6,696)	1.20	(8,035.66)	(6,026.75)
	Totals	(19,904)		$(18,928.82)	$(14,196.61)

Overstate GPM Lease A
Owners Lease B

- State Royalty $ 1,774.58
- Working Interest 12,422.03
- Total Lease $14,196.61

Misallocation of Plant Production

Double Whammy

Lease A	Mcf Delivered	Product	Gpm	Theoretical Gallons	Percent Theoretical	Allocated Production
	510,000	Propane	1.275	650,250	0.56029469	498,662
		Butanes	1.012	516,120	0.54539691	477,222
		Pentanes +	1.066	543,660	0.55036900	487,077
		Totals	3.353	1,710,030		1,462,961
Lease B	Mcf Delivered	Product		Theoretical Gallons	Percent Theoretical	Allocated Production
	450,000	Propane	1.134	510,300	0.43970531	391,338
		Butanes	0.956	430,200	0.45460309	397,778
		Pentanes +	0.987	444,150	0.44963100	397,923
		Totals	3.077	1,384,650		1,187,039
Totals	Mcf Delivered	Product		Total Theoretical		Plant Production
	960,000	Propane		1,160,550		890,000
		Butanes		946,320		875,000
		Pentanes +		987,810		885,000
		Totals		3,094,680		2,650,000

Misallocation of Plant Production

Double Whammy

Lease A	Product	Allocated Production	Value	Revenue	Lease 75.00%
	Propane	11,007	$0.80	$ 8,805.79	$ 6,604.34
	Butanes	10,847	0.85	9,219.88	6,914.91
	Pentanes +	11,037	1.20	13,244.93	9,933.70
	Totals	32,892		$ 31,270.60	$ 23,452.95
Lease B	Product	Allocated Production	Value	Revenue	lease 75.00%
	Propane	(11,007)	$0.80	$ (8,805.79)	$ (6,604.34)
	Butanes	(10,847)	0.85	(9,219.88)	(6,914.91)
	Pentanes +	(11,037)	1.20	(13,244.93)	(9,933.70)
	Totals	(32,892)		$(31,270.60)	$(23,452.95)

Double Whammy
Owners Lease B

- State Royalty $ 2,931.62
- Working Interest <u>20.521.33</u>
- Total Lease $23,452.95

Quadruple Whammy

- Under report your lease
  - Under report Mcf volume delivered
  - Under report GPM content of the gas
- Over report other leases
  - Over report Mcf volume from other leases
  - Over report GPM content of other leases


Quadruple Whammy

Quadruple Whammy

Lease A	Mcf Delivered	Product	Gpm	Theoretical Gallons	Percent Theoretical	Allocated Production
	510,000	Propane	1.275	650,250	0.57129177	508,450
		Butanes	1.012	516,120	0.55645161	486,895
		Pentanes +	1.066	543,660	0.56148142	496,911
		Totals	3.353	1,710,030		1,492,256
Lease B	Mcf Delivered	Product		Theoretical Gallons	Percent Theoretical	Allocated Production
	440,000	Propane	1.109	487,960	0.42870823	381,550
		Butanes	0.935	411,400	0.44354839	388,105
		Pentanes +	0.965	424,600	0.43851858	388,089
		Totals	3.009	1,323,960		1,157,744
Totals	Mcf Delivered	Product		Total Theoretical		Plant Production
	950,000	Propane		1,138,210		890,000
		Butanes		927,520		875,000
		Pentanes +		968,260		885,000
		Totals		3,033,990		2,650,000


Quadruple Whammy

Quadruple Whammy

Lease A	Product	Allocated Production	Value	Revenue	Lease 75.00%
	Propane	20,795	$0.80	$ 16,635.71	$ 12,476.78
	Butanes	20,520	0.85	17,441.81	13,081.36
	Pentanes +	20,872	1.20	25,046.32	18,784.74
	Totals	62,186		$ 59,123.85	$ 44,342.89
Lease B	Product	Allocated Production	Value	Revenue	Lease 75.00%
	Propane	(20,795)	$0.80	$(16,635.71)	$(12,476.78)
	Butanes	(20,520)	0.85	(17,441.81)	(13,081.36)
	Pentanes +	(20,872)	1.20	(25,046.32)	(18,784.74)
	Totals	(62,186)		$(59,123.85)	$(44,342.89)

Quadruple Whammy
Owners Lease B

- State royalty $ 5,542.86
- Working Interest 38,800.03
- Total Lease $44,342.89

Verifying Data From Other Leases Much More Difficult

- May be hundreds of measurement points where gas enters the plant gathering system
- Must rely of the integrity of the plant operator
- Best you can do is the “smell test”

Overstating Gas Volumes From Other Leases How to Check

- Ratio of theoretical volumes to plant production (plant efficiency) should be fairly steady over time
- Change in ratio should be investigated if significant

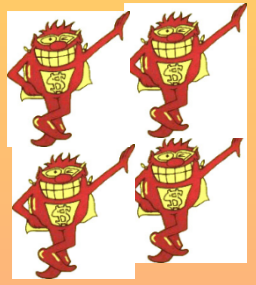
Changes in Plant Efficiency

Plant Efficiency

Actual	Total Plant Production / Total Theorerical	2,650,000 / 3,011,150	=	88.0062435%
Increased Volumes	Total Plant Production / Total Theorerical	2,650,000 / 3,043,680	=	87.0656574%
Increased GPM	Total Plant Production / Total Theorerical	2,650,000 / 3,016,150	=	87.8603518%
Double Whammy	Total Plant Production / Total Theorerical	2,650,000 / 3,098,000	=	85.5390575%
Quadruple Whammy	Total Plant Production / Total Theorerical	2,650,000 / 3,033,990	=	87.3437289%

Quadruple Whammy

- Increases in plant efficiency from understating theoretical production from one lease
- Offset by overstating theoretical production from other leases
- Make it hard to catch



Phantom Leases

- Plant operator could make up some phantom leases that don’t exist
- Give these phantom leases gas volumes and GPM tests
- This would create theoretical volumes for these leases
- Which would result in allocating plant production to these leases
- Take plant production away from other leases

Plant Allocations Without Phantom Lease

Payment For Natural Gas Liquids										
Mcf	Product	Gpm	Theoretical Gallons	Total Theoretical Gallons	Percent Theoretical	Plant Production	Allocated NGLs	Product Prices	NGL Sales	NGL Value
500,000	Propane	1.263	631,500	6,500,180	9.71511558%	5,000,000	485,755.78	$ 0.80	$ 388,604.62	
	Butanes	0.865	432,500	5,000,230	8.64960212%	4,000,000	345,984.08	0.90	311,385.68	
	Pentanes +	0.562	281,000	3,000,440	9.36529309%	2,800,000	262,228.21	1.10	288,451.03	
	Totals	2.690	1,345,000	14,500,850		11,800,000	1,093,968.07		$ 988,441.33	
								Lease Percent	75.00%	$ 741,331.00

Payment For Residue Gas										
Mcf	Product Shrinkage	Theoretical Remaining	Total Theoretical Remaining	Percent Theoretical	Actual Residue	Allocated Residue	Allocated Fuel	Residue Returned	Residue Sold	Residue Value
500,000	34,948	465,052	5,100,000	9.1186728%	4,800,000	437,696	10,940	120,000	306,757	
							$ Mcf	$2.60	$797,567.19	
								Lease Percent	80.00%	638,053.75
							Total Payment			$ 1,379,384.75

Phantom Lease

Mcf	Product	Gpm	Theoretical Gallons	Old Total Theoretical Gallons	New Total Theoretical Gallons
540,000	Propane	1.443	779,220	6,500,180	7,279,400
	Butanes	0.967	522,180	5,000,230	5,522,410
	Pentanes +	0.645	348,300	3,000,440	3,348,740
Totals		3.055	1,649,700	14,500,850	16,150,550

Plant Allocations With Phantom Lease

Payment For Natural Gas Liquids										
Mcf	Product	Gpm	Theoretical Gallons	Total Theoretical Gallons	Percent Theoretical	Plant Production	Allocated NGLs	Product Prices	NGL Sales	NGL Value
500,000	Propane	1.263	631,500	7,279,400	8.6751655%	5,000,000	433,758.28	$ 0.80	$347,006.62	
	Butanes	0.865	432,500	5,522,410	7.8317256%	4,000,000	313,269.03	0.90	281,942.12	
	Pentanes +	0.562	281,000	3,348,740	8.3912158%	2,800,000	234,954.04	1.00	234,954.04	
	Totals	2.690	1,345,000	16,150,550		11,800,000	981,981.34		$863,902.79	
								Lease Percent	75.00%	$ 647,927.09
Payment For Residue Gas										
Mcf	Product Shrinkage	Theoretical Remaining	Total Theoretical Remaining	Percent Theoretical	Actual Residue	Allocated Residue	Allocated Fuel	Residue Returned	Residue Sold	Residue Value
500,000	31,362	468,638	5,638,368	8.3115916%	4,800,000	398,956	9,820	120,000	269,136	
							$Mcf	$2.60	$699,754.63	
								Lease Percent	80.00%	559,803.70
							Total Payment			$ 1,207,730.79

Underpayment to Owners

Payment with phantom lease	$	1,207,730.79
Payment without phantom lease		1,379,384.75
Difference	$	(171,653.96)
State Royalty	$	(21,456.75)
Working interest owners	$	(150,197.22)

Phantom Leases How to Check

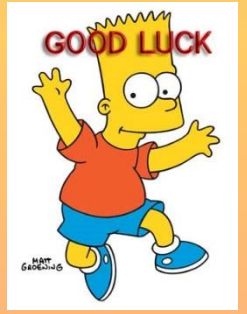
- If you have the time or can hire someone
- Walk the gathering system and account for all measurement points included in the plant allocation statement
- With a large gathering system with hundreds of measurement points, this could take a while

Phantom Leases How to Check

- For a very large gathering system with hundreds of measuring points
- May pick a random sample of measuring points to verify that they exist
- Over time might catch a crooked plant operator

Auditing Gas Plant Statements

- Hardest auditing job
- Even in gas from your lease is correct
- May still be underpaid if other leases are overstated
- Good luck, your going to need it



Battle of San Jacinto

April 21, 1836

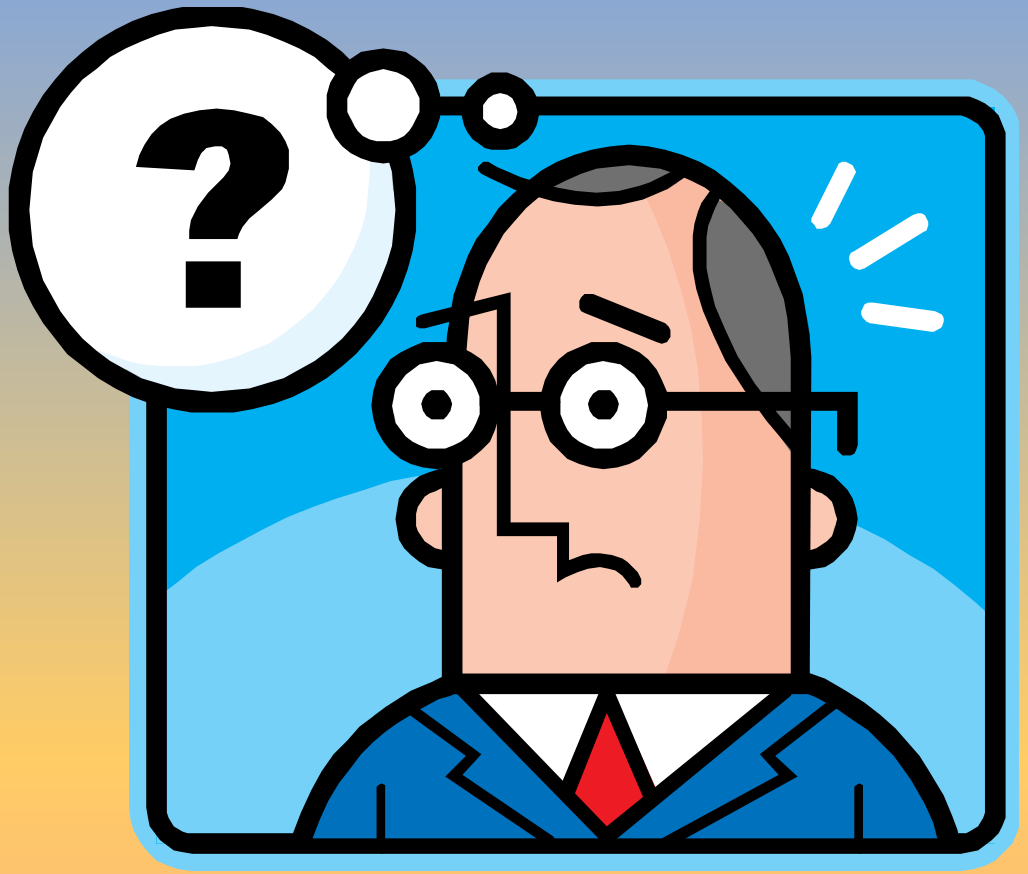
Battle lasted about 20 minutes

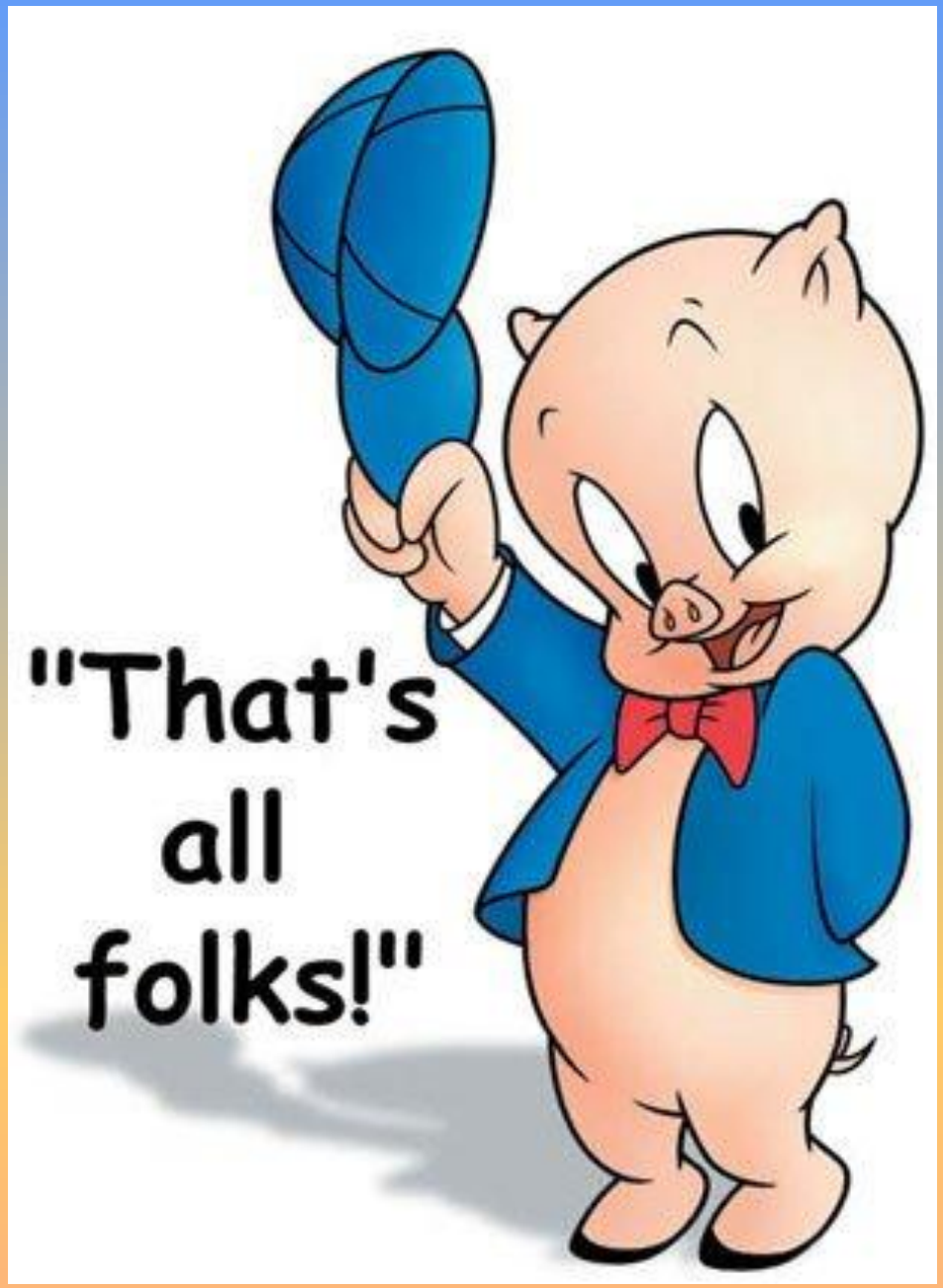
630 Mexican soldiers killed, 730 captured

9 Texans killed

San Jacinto Monument

Questions




"That's
all
folks!"

Thanks For Being Here